

PROPOSED PLAN OF OPERATIONS

SUNNYSIDE TAR SAND UNIT, CARBON COUNTY, UTAH

I

BACKGROUND

It is estimated that the Sunnyside Tar Sand Area has five billion barrels of bitumin contained in tar sand underlying 150,000 acres in Carbon County, Utah. Only 1% of this area has been sufficiently defined to provide quantitative data adequate to determine whether the underlying tar sand can be produced commercially.

The Sunnyside Tar Sand Unit has been formed to support a cooperative effort by the participants to evaluate the tar sand potential and to produce the bitumin where commercially feasible. This unit covers _____ acres with an estimated _____ billion barrels of bitumin underlying it. The Plan of Operations for this unit consists of five stages: Definition, Delineation, Construction, Production and Reclamation.

The Definition Stage will consist of drilling _____ core holes and analyzing the cores in conjunction with surface geological work to determine Areas of Promise. Areas of Promise will include those areas which appear producible by mining and those which appear producible by enhanced recovery methods through well bores. It is estimated that this stage will require one year. During this stage environmental monitoring and recovery technology evaluation and testing will also be conducted. Investigation of access and water sources will also be carried out.

The Delineation Stage will consist of drilling additional core holes upon much closer spacing in the Areas of Promise. The number of such wells will depend upon the number and sizes of the Areas of Promise. It is estimated that this stage will require one year. Continued testing of recovery technology as well as further analysis of the tar sand quality will be made in both the Definition and Delineation Stages. Plans for producing and upgrading the bitumin, access, water supply and environmental protection will be completed.

The Construction Stage will consist of constructing the mine, the bitumin separation and upgrading facilities, drilling injection and producing wells and installing surface facilities. It is estimated that this stage will require two years.

The Production Stage will overlap the Construction Stage as some tar sand will be stockpiled during mine construction. Depending upon the type of enhanced recovery method employed, some production from wells also could occur during the Construction Stage. However, no appreciable revenues are anticipated until commencement of the Production Stage, which is anticipated to require at least twenty years.

The Reclamation Stage will overlap the Production Stage as the surface will be continually reclaimed as it is mined. Reclamation will continue for approximately one year after production has ceased.

II

UNIT AREA

The Sunnyside Tar Sand Unit encompasses 70,000 acres in Carbon County, Utah, including all or portions of T12S - R14-15E, T13S - R13E-14E-15E and T14S - R14E-15E. Exhibit 1 lists the leases included in the unit. The entire area is generally underlain by tar sand in the Green River Formation but the quality, thickness and eroded areas have not been accurately defined.

III

DEFINITION STAGE

The proposed core holes to be drilled during the Definition Stage of the Plan of Operations are shown on Exhibit 2. The locations shown are approximate since these definition wells may be moved in order to avoid terrain problems. The core holes will be drilled in sequence and a number of such holes might be re-located as a result of information gained on prior wells. Exhibit 3 contains a list of the proposed wells, their locations and anticipated depth. A full report of the actual wells drilled, their accurate locations, actual depth and core descriptions will be filed with the Mining Supervisor, Minerals Management Services.

IV

DELINEATION STAGE

The details of this stage will be the subject of a separate submission to the Supervisor and will be based upon the data contained in the report to be filed under the Definition Stage (III above). The Areas of Promise will be shown in the submission with a preliminary conclusion as to how the tar sand in each such area would be produced. Approval would be requested for the additional core holes required to delineate properly the tar sand areas to be produced.

THE SUNNYSIDE TAR SAND UNIT:

A WAY TO BRING A HUGE RESOURCE INTO PRODUCTION

BACKGROUND

The Sunnyside Tar Sand Area has numerous advantages which qualify it to be the first large scale producer of bitumin in the United States. The tar sand resource, estimated at 3 to 5 billion barrels, is adequate for large scale operations. The deposition is in a high relief area readily adaptable to mining by "mountaintop removal" without any serious sand disposal problem. There is private ownership or control of most of the surface area and there are no federal or state designations which would unduly complicate tar sand development. Access is relatively good, ample water can be made available and there is a favorable local attitude toward development. Climatic conditions are favorable for reclamation.

Tar sand ownership is concentrated in the Federal and State governments and a few private owners who would be natural participants in a Tar Sand Unit. The same parties hold the Federal oil and gas leases covering the bulk of the tar sands which can be converted to combined hydrocarbon leases by filing a Plan of Operations for a unit in which such leases are included.

Other advantages of a unit operation include the following:

1. Fostering the national interest by providing the greatest recovery of an intermediate and long-range energy resource of great magnitude.
2. Better protection of environment.
3. More efficient use of water.
4. Better discharge of civic responsibilities.
5. More effective access to the entire area.
6. Greater efficiency and profit, including:
 - a. Single upgrading facility
 - b. Sized for pipeline

- c. Coordinated mining, in-situ and "intermediate" production operations
- d. Larger technological, capital and political base
- e. Cheaper and better reclamation
- f. Expandable-eventually to recover leaner tar
- g. Ready when needed
- h. Showcase for Utah Tar Sand Industry

The Sunnyside Tar Sand Unit (STSU) should be expedited so that those parties which must file a Plan of Operations by November, 1982, may rely upon a fully executed unit. In addition, the unit should be implemented as soon as possible so that cooperative environmental monitoring can be undertaken, zoning and other permitting requirements can be obtained for the Definition Stage, and to insure commencement of that stage in time to gather necessary data prior to bidding on acreage to be made available for acquisition.

SUGGESTED GENERAL PRINCIPLES FOR THE SUNNYSIDE TAR SAND UNIT

The STSU Agreement should track the Plan of Operations, which will be a staged plan probably involving Definition, Delineation, Construction, Production and Reclamation Stages. The Definition and Delineation Stages should have separate participation formulas and the Construction and Production Stage would have a third participation which would be heavily weighted toward resource volume (tar-in-place). It is likely that the Production Stage participation might change over the unit life as operations are extended to new areas within the unit. Outlined below are some suggested major provisions for each stage.

Definition Stage

1. Scope: All tracts within the Area of Mutual Interest which the lease or mineral owner elects to include in the unit. Sufficient coring, geological and other programs designed to determine the location and probable extent of

Areas of Promise which can be further evaluated for determining if production operations therein are justified. Would involve \$3-5MM expenditure, 50-100 core holes, one year.

2. Participation: 100% Acreage

3. Technical Committee:

Supervise Planning and Implementation:

- a. Coring Program
- b. Other geological and evaluation programs
- c. Environmental monitoring
- d. Recovery technology evaluation and testing

On basis of data developed:

- a. Map area underlain by tar, isopach and saturation data
- b. Recommend unit area
- c. Map Areas of Promise based on predetermined criteria
- d. Formulate Delineation Stage program

4. Concurrent Programs:

- a. Lay ground work for negotiating royalty of 6 $\frac{1}{4}$ % or less on bitumin
- b. Eliminate ORR
- c. Seek favorable tax rulings
- d. Lay ground work for obtaining necessary permits
- e. Establish grass-roots PR network

5. Bidding and Acquisition Agreement:

- a. Unit to bid on FNOL when available (Spring of 1984 estimate)
- b. Part of Unit Agreement
- c. Use Tar Sand Regulations to core FNOL lands in AMI

Delineation Stage

- 1. Scope: Sufficient coring, geological and other programs designed to

determine the location and extent of Areas of Operation. Evaluate recovery technologies and select proper technology for each Area of Operation. Would involve \$5-7MM expenditure, ± 100 core holes, one year.

2. Participation: 50% Tar Sand Acreage; 50% Area of Promise Acreage.

3. Technical Committee: Supervise and implements similar programs to those of Definition Stage. On basis of all developed data:

- a. Prepareset of maps on Areas of Promise
- b. Based on predetermined criteria, determine Areas of Operation and tar volumes.
- c. Determine recovery methods for Area of Operation
- d. Develop production and access program for Areas of Operation and obtain approval

4. Concurrent Programs: Complete projects begun in Definition Stage.

5. Biddings & Acquisition: In accord with agreement,

- a. Nominate and bid on available lands and bring into unit those tracts bid on successfully
- b. Consider merging non-unit FNOL properties into unit.

Construction Stage

1. Scope: Negotiate and implement unit agreements for this stage. Construct facilities for mining tar sand and/or recovering bitumin. Would involve \$500MM expenditure for 50,000 BPD and two years construction time.

2. Participation: 50% to Areas of Operation on basis of tar value*

25% to Areas of Promise on basis of tar value*

12½% to Areas of Promise on basis of acreage

12½% to total unit on basis of tar sand acreage.

3. Technical Committee: Supervise and implement

- a. Tar Sand and Tar Production Programs (Mining, In-situ and Intermediate)
- b. Upgrading Facility construction

REVISED DISCUSSION FORMULA FOR PARTICIPATION IN
CONSTRUCTION AND PRODUCTION STAGES

Participation Formula: 50% to Areas of Operation on basis of tar value*
 25% to Areas of Promise on basis of tar value*
 12½% to Areas of Promise on basis of acreage
 12½% to total unit on basis of tar sand acreage

*Tar Value Factor = (Tar Sand Thickness x Saturation) x $(C_1 - C_2)$
x Overburden Thickness) x $(1 / (C_3 - \text{Saturation}))$

This factor, which would be determined for each tract, consists of three elements: The first, the product of Tar Sand Thickness and Bitumin Saturation, represents the relative value of bitumin per tract acre;

The second, a constant minus the product of a second constant times the overburden thickness, qualitatively represents the increase in the value of the tar volume with a decrease of overburden;

The third, the quotient of one divided by the difference between a third constant and Bitumin Saturation, represents the increased value of the tar volume under a tract with an increase in tar saturation.

Some examples of the relative changes in the Tar Value Factor for various constants are as follows:

For $C_1 = 10,000$ and
 $C_2 = 5; 10; \text{ or } 15$: A volume of tar under a tract having 0' overburden would have 1.4; 2.5; or 9 times the value of that same volume of tar under 600' overburden.

For $C_3 = .2; .5; \text{ or } 1.0$: A volume of tar under a tract with 13% saturation would have 2.4; 1.3; or 1.1 times the value of that same volume at 3% saturation.

Selection of different constants will vary the premiums for low overburden and high saturation to any relative value agreed upon.

- c. Environmental Protection and Reclamation Programs
- d. Water supply program
- e. Other programs necessary for tar production

Production Stage:

1. Scope: Produce and sell bitumin and by-products. Operating costs estimated at \$25/bbl or \$450 million per year with gross revenues estimated at \$34/bbl or \$620 million per year (\$580 million to working interest based on 6½% royalty)
2. Participation: Same as Construction Stage (Individual participations would change as Areas of Operation were expanded.)
3. Technical Committee: Oversee all production operations. Seek improved profitability.